DOCUMENT RESUME

ED 363 296 IR 016 415

AUTHOR Griffin, Robert E.; Gibbs, William J.
TITLE International Icon Symbols: How Well Are These Symbols Understood?
PUB DATE 93
NOTE 12p.; In: Art, Science & Visual Literacy: Selected Readings from the Annual Conference of the International Visual Literacy Association (24th, Pittsburgh, PA, September 30-October 4, 1992); see IR 016 399.
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS Business Administration; Comparative Analysis; Cross Cultural Studies; Cultural Differences; Efficiency; Foreign Countries; Graduate Students; Higher Education; Imagery; *International Communication; International Studies; *Nonverbal Communication; Recognition (Psychology); *Signs; *Symbolism; Traffic Control
IDENTIFIERS Graphic Representation; Iconicity; Jamaica; *Symbolic Representation; United States

ABSTRACT

There is a great reliance on symbolic messages in our society, but the success of these messages depends on how they are interpreted. The variability of subjects' interpretations of commonly used visual symbols was investigated by comparing the interpretations of a U.S. audience and a Jamaican audience. Responses of 27 executive master's in business administration (MBA) students attending the University of the West Indies in Kingston (Jamaica) were compared with those of 99 MBA students at Pennsylvania State University. Subjects identified 48 commonly used symbols. For both samples, the familiar no smoking symbol was the most recognized. However, Jamaican and U.S. students differed in their interpretation of the majority of symbols. The symbol language was developed, in part, to help international audiences navigate better in a different culture, but they do not appear to be entirely successful. The implications for the design of communicating symbols are discussed. Seven figures illustrate recognized and least recognized symbols. An appendix presents some of the symbols from the study. (SLD)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED 363 296

International Icon Symbols: How Well Are These Symbols Understood?

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☐ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

by
Robert E. Griffin and William J. Gibbs

Background

There has been a growing tendency in our society to replace printed textual messages with symbols. The argument for replacing words with symbols centers around the hypothesis that symbols convey meaning more efficiently than printed messages. Many believe that symbol use is supported because symbols can be perceived more readily than text[1]. Tierney and King found that symbol perception[2] was quicker than textual perception. Pettersson acknowledges that it is a widely held belief that symbols have become a language of their own[3]. A further belief is that symbols impart meaning despite cultural barriers. Two researchers, Mackett-Stout and Dewar, state "Because many symbols have the potential to be universally understood, language barriers are circumvented"[4].

While some research has purported the utility of symbolic visual communication, controversy still exists over the comprehensibility of many symbols. Gustafson and Roettger reported significant differences in pictorial recognition resulting from picture content and complexity[5]. A symbol may be identifiable but a measure of its usefulness is how well it is understood by the viewer. Symbol comprehension thus is one of the most critical ingredients in measuring the value of any symbol[6]. As the variety of symbols used for visual communication increases the likelihood of them being misinterpreted is great. The implications of misinterpretation are significant in hazardous situations, for example, traffic control situations and toxic environments. As Mackett-Stout and Dewar point out, the rapid development of symbols has brought about a diversity of symbolic versions of identical messages[7]. The need, therefore, to develop methods to evaluate the comprehensibility of symbolic messages is paramount[8].

Purpose of the Study

There is great reliance on symbolic messages in our society. This proliferation of symbols appears to suggest the evolution of a visual language. Communication through symbols, however, necessitates that they be interpreted correctly. Given

"PERMISSION TO REPRODUCE THIS MATERIAL IN OTHER THAN PAPER COPY HAS BEEN GRANTED BY
Alice D. Walker
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

120164115

this assumption, this study set out to test the hypothesis that the symbols used on overhead transparencies, slides and electronic visuals enhance the message for audiences that are not fluent in the language of the presenter. Specifically, the study investigates the variability of subjects' interpretations of commonly used visual symbols. It examines whether the interpretations made by a U.S. audience differ from the those of a Jamaican audience.

Subject Population

Two groups of students were surveyed for the study. The first consisted of 27 Executive MBA students enrolled at the University of the West Indies located in Kingston, Jamaica. The second group consisted of 160 first year MBA students at Penn State University enrolled in a Business Communications course. Of these 160 students, 61 had citizenship other than the United States. Because an aim of the study was to observe cultural differences in symbol perception between Jamaican and U.S. audiences, it was necessary to control cultural diversity with the U.S. group. The responses of the 61 international students were eliminated for the analysis and only U.S. citizen data analyzed. Thus, the total number of subjects in the second group was 99.

Procedures

Subjects received a questionnaire on which they had to identify 48 black and white symbols. The analysis examines a subset of 12 of the 48 symbols used. A listing of symbols, their designated titles and difficulty indexes are shown in Appendix A.

Subjects were asked to construct an open-ended response to identify each symbol. This response mode was chosen rather than multiple choice to prevent cuing subjects to the symbol's meaning.

After collecting the data, all subject responses were reviewed and categorized. Each symbol had a fixed set (no more than 6) possible response categories which were established by the researchers. Categories for each symbol were derived from the subjects' responses to that item. Responses were classified into categories by the researchers. Each category had a Correct Response category and an Other category along with various other responses.

Analysis and Discussion Of The U.S. Data

Efficient symbol identification is based on symbol familiarity[9]. The more familiar an individual is with a symbol the more readily he/she will identify it. It was expected that the U.S. audience would easily recognize and identify the symbols used in this study; however, this was not the case. The average difficulty index for the 12 symbols in the study was .452 when measured on a scale where .0 is unrecognized and 1.0 is completely recognized. A difficulty index is calculated by dividing the number of correct responses for an item by the total number of

responses for that item. The difficulty index of .452 indicates the audience recognized less than half of the items correctly. This is hardly evidence that a language of symbols exists. Further, it indicates that various interpretations are common for even frequently used symbols.

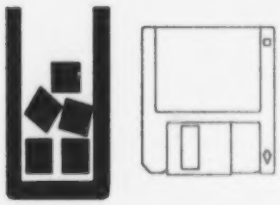
The best recognized symbol of those presented to the U.S. subjects is shown in Figure 1.

Figure 1
Best Recognized
Symbol - U.S.

This symbol is widely seen in many public places within the U.S. It is commonly referred to as the No Smoking symbol and cautions the audience that smoking cigarettes, cigars and pipes is not permitted in the area where the symbol is displayed. All 99 U.S. subjects in the study correctly identified this symbol. Its difficulty index was 1.0.

The two least recognized symbols in the study are shown in Figure 2.

Figure 2
Least Recognized
Symbols - U.S.



The symbol on the left in Figure 2 is identified by the artist that created it as A Glass Of Ice Cubes. None of the subjects identified the symbol by this description. The responses that were given for the symbol were: Trash Can (28%), Ice Machine (26%), Unknown (25%), Drink (8%), and Other (12%). Note that percentages which do not add to 100% are due to rounding. In the researchers' judgement the second most desirable response could have been Drink, however, only 8% of the subjects selected this response. From this data it appears that this symbol fails to communicate the concept of a glass of ice or an iced drink. Possibly the level of abstraction deterred the audience from correctly identifying it. Abstract symbols are more difficult to interpret than those which are more concrete[10].

The other poorly recognized symbol is the one on the right side of Figure 2, a 3.5 Inch, Low Density Floppy Diskette. No one correctly identified this item. Many readers may consider this response a trick question because the responses given for the question were: Computer Disk (54%), 3.5 Floppy Diskette

(27%), Unknown (10%) and Other (9%). The trick to the question was the alignment hole on the right top of the computer disk. The hole is an alignment hole that tells the computer the diskette is a low density diskette. Most may judge this as a minor point, however, the researchers believe the fact that many people did not properly recognize this symbol is significant. It demonstrates that people did not read this visual for detail. The current audience appeared to view it in a superficial manner. Pettersson refers to two levels of image perception. In the first, the low cognitive level, the viewer takes a holistic view of the image and processes it quickly. Pettersson cites, "The information is handled as a whole in parallel, simultaneous, tentative, rough, holistic and fast processing"[11]. In the second level, the high cognitive level, he says additional processing occurs. "Certain details in the image attract more eye fixations. The information is processed again, several times, detail by detail"[12]. It is possible that the symbol of the computer disk was perceived at a lower cognitive level. The detailed processing associated with a high cognitive level of image perception appeared to be non-existent. For the U.S. audience this lack of processing may be due to their familiarity with a computer disk. Their immediate recognition of this symbol may have prevented further detailed processing.

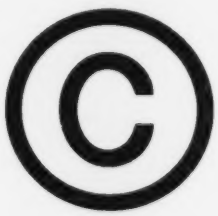
Three additional observations should be made from the U.S. data. First, subjects showed an ability to read compound visuals as visual sentences. The symbols shown in Figure 3 are a grouping of a question mark and a clock.

Figure 3
Compound Symbols

The artist who created the symbol asserted that this grouping meant "What time is it". Most subjects (70%) correctly identified this grouping of symbols. It appears that multiple symbols can be grouped to form sentences.

The second interesting observation was the inability of the subjects to recognize Figure 4 as the copyright symbol.

Figure 4
Out of Context
Symbol



Only 26% of the subjects correctly identified the symbol. The remaining responses were: Unknown (43%), Other (26%) and Letter C (4%). Surely the copyright symbol is

one of the most widely used symbols, but it does not appear to be readily recognized. The researchers assume that the difficulty in recognizing it had to do with the symbol being presented out of context. "A context within which a symbol is presented has a significant effect on how it is perceived"[13]. "It is quite conceivable that people who understand the generic concept conveyed by a given symbol may fail to correctly infer its meaning in a particular context because they fail to correctly perceive its referent"[14]. Normally the copyright symbol is presented in a very small typeface with descriptive information following the symbol. In the current study, however, it was presented without description.

The third interesting finding in the study was the confusion of three traffic symbols. These symbols are shown in Figure 5.

Figure 5
Traffic Symbols

The symbol on the left of Figure 5 is a Walk symbol. It is used on traffic signals in towns where pedestrian traffic is controlled. When pedestrians are permitted to cross the street the walk signal is illuminated. This symbol was only identified by 16% of the subjects. It was most often identified as a Pedestrian Crossing (63%).

The symbol shown in the center of Figure 5 is School Crossing. It is used as a traffic sign, black characters on a yellow field, to designate school children crossing the street A large percentage (63%) of subjects identified it correctly although a number of subjects (29%) identified the symbol as a Pedestrian Crossing. There was obvious confusion between pedestrians and children.

The symbol on the right of Figure 5 is Pedestrian Crossing. This symbol is also used as a traffic sign and is located at areas where pedestrians are likely to be crossing from one side of the street to the other. The sign again has black characters on a yellow field. This symbol was one of the better recognized symbols with 88% of the subjects recognizing it. Only 1% of the subjects confused this symbol with the school crossing symbol.

Fisher notes the adequacy of traffic symbols has been the focus of much empirical inquiry[15]. Some methods for presenting traffic information have been shown to be more effective than others, however, much controversy exists pertaining to engineering traffic control messages[16]. The three traffic symbols presented in the current study appear to lend support to the lack of reliability of traffic control messages. While confusion over these signs will probably not result in safety problems, it should be remembered that they are presented

in every driver safety education manual and should be well known. Even the meaning of frequently used traffic symbols can be misinterpreted.

Comparison Of U.S. and Jamaican Data

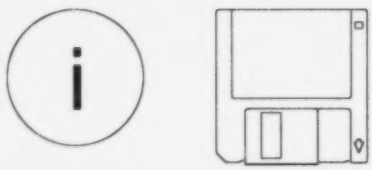
This study was originally developed to test the hypothesis that symbols were good to use on overhead transparencies, slides and electronic visuals when audiences were not fluent in the language of the presenter. The assumption was that symbols helped the audience understand the written words on the visuals. This situation is common in today's world of international business. For example, it is common for English speaking business people to be doing business with the Japanese and any means of maximizing communication is beneficial. Conventional wisdom has always suggested that if a visual designer used commonly identified symbols on the visuals the audience would better understand their purpose.

The Jamaicans were less able to identify the symbols than the U.S. subjects. While the U.S. subjects had an average difficulty index of .452, the Jamaican subjects had an average difficulty index of.253 for the 12 symbols. This suggest that Jamaicans had more difficulty interpreting symbols than U.S. subjects.

The No Smoking symbol was recognized by 96% of the subjects. It was the most recognized of all the symbols used. This result is consistent with data obtained from U.S. subjects.

The least recognized symbols for the Jamaicans are shown in Figure 6.

Figure 6
Least Recognized Symbols - Jamaica



The symbol on the left of Figure 6 indicates the availability of information. It is used extensively in the popular software programs from Microsoft called Windows and other programs using the Windows operating system. It is also used to identify places were information can be found. No one identified the symbol correctly. The most common response for it was No Response (63%).

The symbol on the right side of Figure 6 is again the 3.5 Inch Low Density Floppy Diskette. No one correctly identified it. The response selected by the Jamaican subjects was different than that chosen by the U.S. group. The most common Jamaican response was Unknown (41%).

Implications Of The Study

There are many implications that can be drawn from this study. For the researchers, what began as a

study to determine if it was helpful to use symbols in presentations to an audiences having a different primary language, turned into a critical indictment of the usefulness of symbols in any presentation. Four major implications can be made from this study.

First, both the Jamaican and U.S. audiences differed in their interpretation of the majority of the symbols in the study. While the reader should be cautioned not to generalize these findings, it appears that the symbols employed in the current inquiry do not have the power of a written language or the spoken word. From this small study it is evident that people often mistake or do not know the meaning of many symbols. This research indicates that while symbols often provide a general meaning to an audience they can not be counted on to deliver a more specific meaning. Researchers have criticized inquires which attempt to test the ability of generic symbols to convey specific meanings. The specific meaning of a symbol must be deduced by first applying the generic concept implied by the symbol to a context specific referent[17]. Possibly, the symbol in the present study did not provide sufficient contextual cues for making inferences as to their specific meaning. Conceivably, the confusion over the traffic signs (Walking, School Crossing and Pedestrian Crossing) shown in Figure 5, suggests that a general understanding of the communication context was achieved, but not a specific understanding. Often we are not even blessed with a general understanding when symbols are used as shown in Figure 2. Surely the concepts of a glass of ice cubes and a trash can are worlds apart.

A second implication is that international audiences do not understand symbolic messages in the same manner as U.S audiences. As Pettersson points out, image perception is relative [18]. The Jamaican subjects used in this study did far worse on symbol identification than their U.S. counterparts. The symbol language was developed, in part, to help internationals better navigate in a different culture. However, symbols may confuse meaning. The researchers collected additional data from Thailand and although it was not included in this paper the results appear to be similar to the analysis of the Jamaicans. Thais misinterpreted many of the symbols used.

The third implication drawn from the data involves the kind of meaning we derive from symbols. Most subjects seem to make quick fixations and rapid judgments about pictures. Subjects do not spend much time looking at a symbol before they determine meaning. This may contribute to variability between symbol interpretations. For example, in the case of the floppy diskette in Figure 2, subjects did not notice the hole which would have identified the disk as a low density floppy diskette. Most subjects simply called the object by its more generic name, computer disk. In another example, the traffic symbols in Figure 5, many subjects did not

notice the absence of crosswalk lines in the walking symbol and believed it designated some type of crosswalk symbol. These observations can lead one to speculate that for some symbols viewers employ a low level of perceptual processing and detailed processing does not occur[19]. The symbol is identified in a generic sense but image details are not noticed and therefore not processed. Symbols apparently have not developed all of the power of a written or spoken language.

The fourth implication of the data is that if symbols must be used, we should use only those that are commonly understood by all people. Of the symbols studied, some of the traffic and the no smoking signs were well recognized by the subjects in this study. When new symbols were introduced they were very difficult for the audience to identify. New symbols should be pilot tested before they are used on critical audiences. There is a need to effectively measure symbolic messages for comprehensibility and legibility[20].

Much more work needs to be done on the topic of symbol recognition. While the use of symbols appears to make business visuals more attractive and interesting, this study suggests that they do not necessarily enhance meaning. The use of symbols may even confuse the purpose of a visual. Additional research needs to be conducted to assess the reliability of symbols to enhance the meaning of visuals.

1. Frantz, J., Miller, J.M. and Lehto, M.R., *"Must The Context Be Considered When Applying Generic Safety Symbols: A Case Study In Flammable Contact Adhesives,"* **Journal of Safety Research,** 22 (1991) pp. 147-161.

2. Tierney, W.J. and King, L.E., *"Traffic Signing - Symbols Versus Words,"* **The Sixth World Highway Conference of the International Road Federation,** (1970) pp. 1-40.

3. Pettersson, R., **Visuals For Information,** Englewood Cliffs, New Jersey: Educational Technologies Publications, 1989.

4. Mackett-Stout, J. and Dewar, R., *"Evaluation of Symbolic Public Information Signs,"* **Human Factors**, 23 (1981) pp. 139-151.

5. Gustafson, M.R. and Roettger, S.I., *"Pictorial Literacy Skill of Haitian and Hong Women,"* **Journal of Visual Literacy,** (1991) pp. 75-84.

6. Mackett-Stout, J. and Dewar, R., pp. 139-151.

7. Ibid

8. Dewar, R.E. and Ellis, J.G., *The Semantic Differential As An Index of Traffic Sign Perception and Comprehension,"* **Human Factors,** (1977) pp. 183-189.

9. Eley, M.G., *"Identifying Rotated Letter-Like Symbols,"* **Memory and Cognition** 10:1 (1982) pp. 25-32.

10. Mackett-Stout, J. and Dewar, R., pp. 139-151.

11. Pettersson, R., p. 90

12. Ibid., p. 90

13. Ibid. p. 263

14. Frantz, J., Miller, J.M. and Lehto, M.R., pp. 231-237.

15. Fisher, J., *"Testing The Effect of Road Traffic Signs' Informational Value On Driver Behavior,"* **Human Factors,** 34:2 (1992) pp. 231-237.

16. Whitaker, L.A., *"Response Time To Left and Right Directional Signs,"* **Human Factors,** 34 (1992) pp. 231-237.

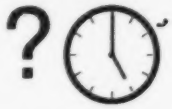
17. Frantz, J., Miller, J.M. and Lehto, M.R., pp. 147-161.

18. Pettersson, p. 90.

19. Ibid

20. Dewar, R.E. and Ellis, J.G., pp. 183-189.

APPENDIX A

Symbol	Accepted Title	U.S. Difficulty Index	Jamaican Difficulty Index
	No Smoking	1.00	.96
	What time is it?	.70	.33
	Information	.35	.00
	Pedestrian Crossing	.16	.26
	Poison	.77	.30
	School Crossing	.63	.22
	United States	.40	.04

APPENDIX A (continued)

Symbol	Accepted Title	U.S. Difficulty Index	Jamaican Difficulty Index
	Pedestrian Crossing/Cross Walk	.88	.67
	Copyright	.26	.11
	Squat Toilet	.27	.11
	Glass With Ice Cubes	.00	.04
	3 1/2 inch Low Density Disk	.00	.00